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Remarks

Thorough examination by the Examiner is noted and appreciated.

The claims have been amended.

No new matter has been added.

For example, support for the amendments is found in the originally and previously presented claims, the Figures (including Figure 2), and in Specification:

[0007] A typical conventional **CVD (chemical vapor deposition) system** is illustrated schematically by reference numeral 10 in FIG. 1. The CVD system 10 generally includes an enclosure assembly 6, having a vertically-movable wafer support pedestal 12 disposed beneath a showerhead 30, through which process gases **enter a vacuum chamber 15**. A pumping plate 17 may extend around the wafer support pedestal 12 for discharging process gases and other plasma residue from the chamber 15 and into a pumping channel 14 partially circumscribing the chamber 15, as indicated by the arrows 21.

0012] A common characteristic of a conventional **CVD system**, as well as other types of semiconductor processing systems extensively used in the semiconductor fabrication industry such as **PVD (physical vapor deposition) chambers, etching chambers and ashing chambers**, for example, is that the showerhead on the interior of the chamber is mounted in place using screws or other fasteners which protrude beyond the interior surface of the showerhead. The region of the showerhead surrounding the fastener tends to become damaged by thermal expansion cycling or plasma arcing, and this causes the accumulation of particles in the

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damaged area. It has been found that mounting the showerhead in place using fasteners which are embedded in the surface of the showerhead or extend from the process chamber exterior, through the wall of the chamber and into the showerhead significantly reduces thermal cycling damage which may otherwise facilitate the accumulation of contaminating particles thereon.

Claim Rejections under 35 USC 103

1. Claims 1, 2, 21-28, and 31-34 stand rejected under 35 USC 103(a), as being unpatentable over Masuda et al. (US PUB 2002/0000197) in view of Schriever (US 4,085,661), and Ohta (US 4,526,132).

Masuda et al. describes a shower plate 12, Figure 2, "installed in the vacuum vessel 10 near the ceiling". Figure 2 shows a schematic representation of a showerhead 12 that is described as "having small holes so that the raw material gas introduced into the gas storing chamber 18 passes through the small holes of the shower plate 12 and sprayed into the reactor chamber" (see paragraphs 0088, 0111, 0121).

Masuda et al. also describes a lift shaft installed airtight to penetrate the bottom plate of the vacuum vessel 10 (see paragraph 0060).

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Masuda et al. nowhere suggests or discloses how the showerhead 12 is installed. Masuda et al. nowhere describes that the showerhead engages the chamber wall or if a confinement structure is used to direct the gas from the gas storage space 18 through the showerhead. In any event, assuming *arguendo* that **one may conclude from the schematic shown** in Masuda et al. that the **showerhead engages the chamber wall**, as Examiner argues, Masuda et al. nowhere suggests or discloses how the showerhead 12 is installed.

Examiner admits that Masuda et al. fail to disclose "the shower head is held by a plurality of lateral fasteners extending through the chamber wall, each fastener includes a fastener head and threaded shank, and the fasteners structurally isolated from the chamber interior".

Examiner has not referred to Applicants claim language which is also not disclosed by Masuda et al. e.g.:

"a plurality of exterior fasteners extending from an exterior of said process chamber through and penetrating said chamber wall into said chamber interior and into said showerhead, with an exterior portion of said plurality of exterior fasteners

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physically separated from said chamber interior to prevent said particle contamination from said fasteners to said chamber interior".

The **absence of any disclosure** as to how the shower plate of Masuda et al. is mounted or supported **does not disclose any mounting requirement by Masuda et al.** and such absence of disclosure **provides no motivation to modify Masuda et al.** Rather, the only apparent motivation appears to be Applicants disclosure, which is impermissible.

Masuda et al. nowhere recognizes or suggests a solution to the problem that Applicants have recognized and solved by their claimed invention:

"An apparatus to reduce particle contamination to a semiconductor device process chamber interior by thermal cycling of fasteners"

Examiner argues that the motivation for modifying Masuda et al. is "to provide a method of mounting the showerhead of Masuda et al. (i.e., an interior part having a lateral surface engaging the chamber wall) as required by Masuda et al. but not described

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and as taught by Ohta".

However, as noted above, **the absence of any disclosure** as to how the shower plate of Masuda et al. is mounted or supported does not disclose or suggest any particular mounting requirement by Masuda et al.

In addition, Ohta nowhere discloses a method that would work to support the shower plate of Masuda et al., and furthermore, the method of Ohta which teaches mounting of a device (discharger 37) on a flange with a screwing bolt where **the screwing bolt remains exterior to the chamber** does not produce the missing elements of Applicants invention including:

"a plurality of exterior fasteners **extending from an exterior of said process chamber through and penetrating said chamber wall into said chamber interior and into said showerhead,** with an exterior portion of said plurality of exterior fasteners **physically separated from said chamber interior** to prevent said particle contamination from said fasteners to said chamber interior."

For example, Ohta discloses a discharger 37 mounted on a

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flange 39 (see Figure 2, 3 and 4) where holes 51 are provided so that a **screwing bolt 52** can be screwed through the hole 51 (col 3, lines 55-60; col 4; lines 12-23), to **penetrate and extend through a lip of the protrusion tube 30a to remain exterior to the chamber**; i.e., the bolt 52 **does not extend through and penetrate the chamber wall into the chamber interior** (see Figures 3 and 4).

i.e., "Flange 39 is fixed to protrusion tube 30A of bell jar 30 by **screwing bolt 52 into screw hole 51**, so that opening 53 of protrusion tube 30A can be sealed. At this time, a sealing member such as rubber made O-ring 55 is fitted in a ring-shaped groove which is formed on the inner surface of flange 39, and thus protrusion tube 30a and flange 39 are fixedly joined to be airtight" (see col 4, lines 12-19).

In further contrast, Examiner cites Schriever where a hydraulic cylinder head with penetrating bolts is described. Examiner refers to "lateral fasteners 8 extending through the cylinder wall 3 and attaching an arcuate locking segments 4. Each fastener includes a fastener head and a threaded shank, and the fasteners are structurally isolated from the chamber interior." See Figures 1 and 4.

More specifically, Schriever discloses:

"To assist in the assembly and disassembly of the hydraulic cylinder head, each locking segment 4 is provided with a **bolt 8**

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which passes through a clearance hole in the cylinder wall and threads into a hole in the locking segment 4. This bolt 8 serves as a means of drawing the locking segments 4 into the grooves 5 and of tapping them loose." (col 4, lines 50-54).

Schriever refers to a cylinder head while Examiner asserts that the cylinder wall forms **a chamber** and bolts are described that penetrate the cylinder wall where Schriever describes a structure and method **that is unrelated to the problem of supporting a shower plate within a vacuum chamber**, therefore describing non-analogous art. There is no reason to expect that modification of Masuda et al. to use the bolts of Schriever would be desirable or workable to support the shower plate of Masuda et al. within a vacuum chamber. Since the teachings of Schriever are not pertinent to supporting a structure within a vacuum chamber, such teachings are non-analogous art. Moreover, Schriever nowhere discloses a chamber, including a process chamber adapted to operate under vacuum, but rather discloses a cylinder wall adjacent to a locking segment which assists in engaging an annular cap 19 which protects the hydraulic cylinder from damage (col 8, lines 1928).

**2141.01(a) Analogous and Nonanalogous
Art
TO RELY ON A REFERENCE UNDER 35 U.S.C.**

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103, IT MUST BE ANALOGOUS PRIOR ART

The examiner must determine what is "analogous prior art" for the purpose of analyzing the obviousness of the subject matter at issue. "In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." *In re Oetiker*, 977 F.2d 1443, 1446, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). See also *In re Deminski*, 796 F.2d 436, 230 USPQ 313 (Fed. Cir. 1986); *In re Clay*, 966 F.2d 656, 659, 23 USPQ2d 1058, 1060-61 (Fed. Cir. 1992) ("A reference is reasonably pertinent if, even though it may be in a different field from that of the inventor's endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to an inventor's attention in considering his problem."); and *Wang Laboratories Inc. v. Toshiba Corp.*, 993 F.2d 858, 26 USPQ2d 1767 (Fed. Cir. 1993).

As noted above, the absence of any disclosure as to how the shower plate of Masuda et al. is mounted or supported does not disclose any particular mounting requirement by Masuda et al. and such absence of disclosure provides no motivation to modify Masuda et al. Rather, the only apparent motivation to modify of Masuda et al. appears to be Applicants disclosure, which is impermissible.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re*

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Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Examiner states that "it has been held that applying a known technique to a known device ready for improvements to yield a predictable result is obvious (see *KSR International Co. v. Teleflex, Inc.*). Examiner cites no support for such interpretation of *KSR International Co.* Indeed, the quoted language appears to be mistaken. Rather, the language issued by *KSR International Co.* is " **The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.**". However, *KSR International Co.* also makes clear that the traditional Teaching-Suggestion-Motivation) test motivation of *Graham v. John Deere*, 383 U.S. 1, 148 USPQ 459 (1966) as outlined in the MPEP is not changed by their ruling in *KSR International Co.*

"Neither the enactment of §103 nor the analysis in *Graham* disturbed this Courts earlier instructions concerning the need for caution in granting a patent based on the combination of elements found in the prior art. For over a half century, the Court has held that a patent for a combination **which only unites old elements with no change in their respective functions** . . . obviously withdraws what is already known into the field of its monopoly and diminishes the resources available to skillful men.. *Great Atlantic & Pacific Tea Co. v. Supermarket Equipment Corp.*, 340 U. S. 147, 152 (1950). This is a principal reason for declining to allow patents for what is obvious. **The combination**

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of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results."

Examiner has nowhere shown that Applicants claimed technique of **attaching showerheads in a vacuum chamber** (selected from the group consisting of a vapor deposition chamber, an ashing chamber and an etching chamber) is a known method and nowhere shows in the prior art a recognition of the problem that Applicants have recognized and solved by their invention:

"An apparatus to reduce particle contamination to a semiconductor device process chamber interior by thermal cycling of fasteners".

Rather, Examiner, under current MPEP guidelines is required to evaluate the invention as a whole:

**DISCOVERING SOURCE/CAUSE OF A PROBLEM
IS PART OF "AS A WHOLE" INQUIRY**

"[A] patentable invention may lie in the discovery of the source of a problem even though the remedy may be obvious once the source of the problem is identified. This is part of the 'subject matter as a whole' which should always be considered in determining the obviousness of an invention under 35 U.S.C. § 103." *In re Spinnoble*, 405 F.2d 578, 585, 160 USPQ 237, 243 (CCPA 1969). However, "discovery of the cause of a problem . . . does not always result

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in a patentable invention. . . . [A] different situation exists where the solution is obvious from prior art which contains the same solution for a similar problem." *In re Wiseman*, 596 F.2d 1019, 1022, 201 USPQ 658, 661 (CCPA 1979) (emphasis in original).

Moreover, the modification of the showerhead of Masuda et al. with Schriever nowhere discloses or suggests the following elements of Applicants invention including those elements in **bold type**:

"a process chamber adapted to operate under vacuum, said process chamber having a substantially vertical chamber wall defining a chamber interior"

and

"a plurality of exterior fasteners **extending from an exterior of said process chamber through and penetrating said chamber wall into said chamber interior and into said showerhead**, with an exterior portion of said plurality of exterior fasteners **physically separated from said chamber interior** to prevent said particle contamination from said fasteners to said chamber interior."

See MPEP 2143.03

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**2143.03 All Claim Limitations Must
Be Taught or Suggested**

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

Since Masuda et al., as modified by either or both Schriever or Ohta et al. do not disclose or suggest the elements of Applicants independent claims, neither are the elements of Applicants dependent claims suggested or disclosed, which features further support patentability on their own merits.

2. Claims 3, 5, 29, 30, 35 and 36 stand rejected under 35 USC 103(a), as being unpatentable over Masuda et al., in view of Schriever and Ohta, above, and further in view of Lilleland et al. (US 6,073,577).

Applicants reiterate the comments made above with respect to Masuda et al., Schriever, and Ohta.

Even assuming *arguendo* a proper motivation for modifying the

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reaction chamber of Ohta based on the teachings of Lilleland et al., the fact that Lilleland et al. disclose a **showerhead electrode (10) and one or more baffle plates (22)** above the showerhead electrode (10) and a confinement ring (17) (Figure 1), and **nowhere suggests or disclose how the showerhead electrode or showerhead electrode assembly is mounted in a process chamber,** such modification does not further help Examiner in producing Applicants invention.

In addition, it is noted that modifying Masuda et al. with the confinement ring of Lilleland et al. **would ensure that the showerhead of Masuda et al. would not engage the reactor walls,** as the confinement ring of Lilleland et al. or dielectric annular ring 18 (**being exterior to the shower head 10**) would engage the chamber walls (see col 2, lines 49-54) in the modified structure of Masuda et al., thus further ensuring that such modification would not produce Applicants invention.

"First, there must be some **suggestion or motivation,** either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. **Second,** there must be a **reasonable expectation of success.** **Finally,** the prior art

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reference (or references when combined) **must teach or suggest all the claim limitations**. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

A prior art reference must be considered in its entirety, i.e., as a whole including portions that would lead away from the claimed invention." *W.L. Gore & Associates, Inc., Garlock, Inc.*, 721 F.2d, 1540, 220 USPQ 303 (Fed Cir. 1983), cert denied, 469 U.S. 851 (1984).

Conclusion

The cited references, either individually or in combination, do not produce or suggest Applicants invention, and are therefore insufficient to make out a *prima facie* case of obviousness with respect to both Applicants independent and dependent claims.

The Claims have been further amended. A favorable consideration of Applicants' claims is respectfully requested.

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Based on the foregoing, Applicants respectfully submit that the Claims are now in condition for allowance. Such favorable action by the Examiner at an early date is respectfully solicited.

In the event that the present invention as claimed is not in condition for allowance for any reason, the Examiner is respectfully invited to call the Applicants' representative at his Bloomfield Hills, Michigan office at (248) 540-4040 such that necessary action may be taken to place the application in a condition for allowance.



Respectfully submitted,

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